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SELECTIONS

From The Youth's Companion.

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THE GRIZZLY GIANT

The Mariposa Grove.

The Big Trees of California.

The Big Trees of California represent the largest growth known in the vegetable kingdom of the world, with the exception of a species of the Eucalyptus of Australia.

The Grizzly Giant, one of the most famous of the trees in the Mariposa Grove, has its first limb one hundred feet from the roots. This limb is six and one-half feet in diameter. Nine feet from the ground the tree is twenty-seven feet in diameter, and below that height its thickness increases. The tree stands grim and grizzly, far apart from any of its companions, in sublime and solitary grandeur.

All the largest and most prominent of the Big Trees have their distinguishing titles. Each of the states has its representative among the names; and many of America's most famous men are honored in the appellations. General Grant has a namesake, as grim and stolid as the great general, who was present, I believe, at the christening of the tree.

One of the greatest of the trees lies fallen on the earth, and is called the Fallen Monarch. It is estimated that the Fallen Monarch was about four hundred feet high, and nearly forty feet in diameter. The bark and sap are now gone, but the tree still measures nearly thirty feet in diameter as it lies prone on the earth. A long ladder is used in mounting to its crest.

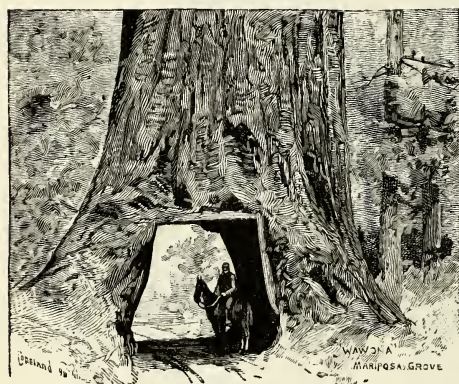
The very largest of the Big Trees of California are in what is known as the Calaveras Grove, which is owned by private parties. Among these there is a dead and fallen tree, which is supposed to have been forty feet in diameter, and four hundred and fifty feet high. It is estimated that it has been prostrate a thousand years. The sap and bark of this tree are gone, but the diameter of its trunk still measures thirty-four feet.

The tallest tree standing is called the New York tree;

it is thirty feet in diameter, and three hundred and sixty-six feet high. There is another tree, not so tall, which is thirty-seven feet in diameter, and the bark alone measures thirty-one inches in thickness.

In the Mariposa Grove there is a tree known as the Telescope. The trunk is a hollow cylinder, open at the top, about one hundred feet away. The cavity at the base is large enough to shelter half a dozen men on horseback. One of the largest of the fallen trees is also hollow. One may

ride in at the lower end, and go out at a knot-hole one hundred feet up the trunk.



One of the most remarkable of these gigantic trees stands directly over the broad roadway which has been constructed through the grove. There is an archway for the drive, cut

through the base of the very tree itself. This archway, which was bored and burned through, is some ten feet in diameter and twelve feet high, and on each side there yet remains ten feet of solid wall of wood which supports the tree. Into the archway, under the vertical trunk of the tree, a stage-coach drawn by four horses may be driven, and can find there secure shelter from rain or storm above.

There are in all some six hundred of these Big Trees in the Mariposa Grove. Twenty-five hundred acres of land have been withdrawn from sale by the general government, and they are now kept as a National and World's Park, held in trust forever by the state of California for the people of the world. The reservations include the Yosemite Valley.

The park is usually inaccessible during the winter and spring, in consequence of the deep snowfall there, but it is visited during the summer and autumn by tourists from all parts of the world, and especially by people of the Old World, who find these trees of very great interest.

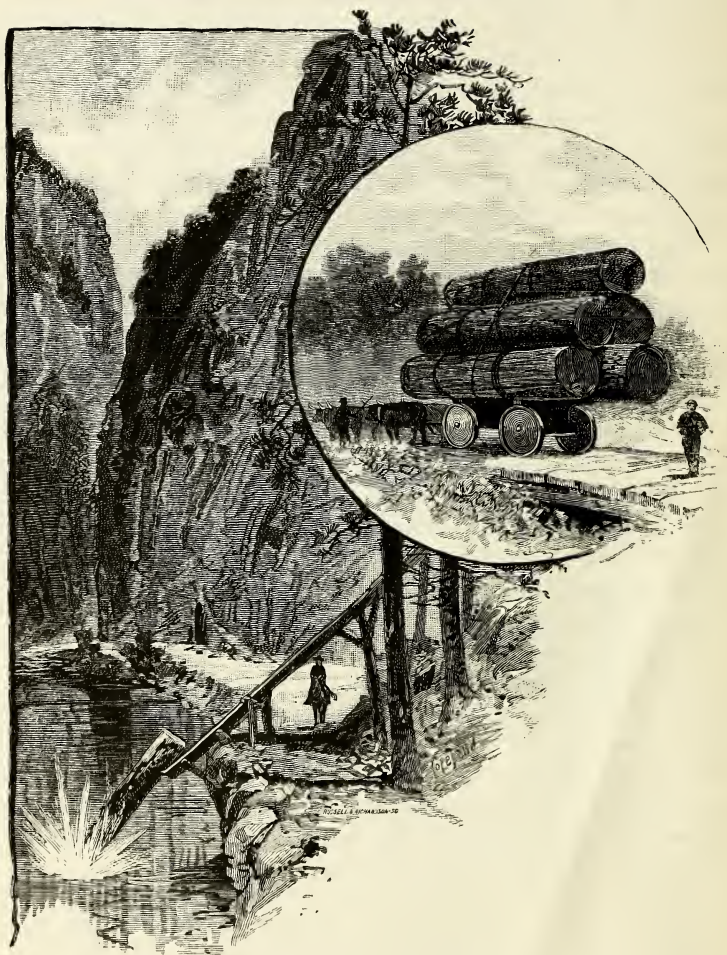
The wood of these big trees is a variety of the cedar. The Redwood of the Pacific is of the same family. Some of the trees standing in California are estimated to be between two and three thousand years old.

The heart of the tree is thought to be indestructible by the decay that is usual in other woods exposed to atmospheric influences. This certainly does not rot under ordinary climatic action. Furthermore, the wood does not shrink like other timbers, since it contracts from the ends and not from the sides or edges, as is usual with other varieties.

Specimens of these trees are not allowed to be taken by tourists from the National Reservations. Not even a twig, or shrub, or flower is permitted to be plucked. Policemen and guards are stationed throughout the parks to prevent spoliation by tourists. There live, however, upon the reservation licensed parties who have for sale the seeds of this species of wonder-wood. Foreigners are usually the heaviest purchasers.

Many young trees of the Big Tree species have been started in various parts of California, and are now growing thriftily. They are found in the streets of Los Angeles, San Bernardino and other southern California cities. Though it might be supposed that a tree whose age is reckoned so great would be of very slow growth, the young Sequoias are found to grow quite rapidly. The Californians of one thousand years hence may see them in their full prime.

M. V. MOORE.



The Lumbermen of the Sierras.

The Lumbermen of the Sierras.

Travelling northward among the mountains from Glenbrook on Lake Tahoe, we were appalled by the desolation which the lumbermen have left in their wake. Clearing a tract of every sound tree, they remove to another locality, only to leave behind them again the hastily-built shanty which has sheltered them, and a litter of chips and decaying boughs.

We rode for days through regions stripped bare, and strewn with fragments, where broad forests once existed. Here and there a pine or fir, that has been rejected on account of its infirmity, stands alone, and seems to grieve for its lost companions.

As often as they move, the lumbermen build a new house and furniture, taking only the cooking utensils and bedding with them. The old house is left open to be blown down by the wind, crushed by the heavy winter snows, or occupied by anybody who comes along. Both the house and furniture are frail, and the latter consists in most cases of nothing more than two or three benches and a table made of rough timber. The house and its occupants are collectively called a camp.

We put up one night at Marlette's camp, which is under Prospect Peak. The men had not come home when we arrived, but the cook was busy preparing supper. He was a white man; most cooks in the Sierras are Chinese.

We had pitched our tents, and were waiting for our own ration of bacon and bread, when a great clatter of hoofs and voices seemed to shake the mountains. There was a break in a neighboring wood, and out of this sprang a score of men, some mounted and some unmounted, who came toward us with the wildest yells, and at the greatest speed. A parcel of schoolboys let out on a brisk autumn evening could not

have been gladder than these big, rough lumbermen were at the end of their day's labor.

After dark, we went into the cabin in which the men were eating. The long table was covered with dishes, and around it gathered as hungry a crew as ever relished unlimited beef-steak, potatoes and onions. It was an excellent supper. Beside the more substantial things, there were pickles, fresh butter, hot bread, cake and tea. There were candles, too, and a good deal of them must have got into the food, as one was stuck into the spout of a coffee-pot, another into the neck of a syrup-bottle, and another into a crack of the table. Nobody minded this, however, and everybody ate with the appetite of a giant.

When supper was over and the table cleared, a fiddle was brought out, a very old and tuneless fiddle indeed, but its squeaking afforded the company vast satisfaction, and stirred them to some extraordinary antics, which, as a matter of courtesy rather than of fact, were called a dance. Some of the quieter men retired into corners, and read, or wrote letters home.

Home seemed to be very far away as we left the cabin and saw its little windows shining ruddily in the dark night. The snowy peaks were all around, looking terribly lonely and massive under the starlit California sky; the pines were densely black; our own camp-fire cast off mysterious wreaths of smoke; but the little settlement of men took some of the sadness away from the scene.

The lumbermen work in the mountains until winter drives them to the lowlands. Their wages are about fifty dollars and board a month. Many Chinamen are also employed, but they are not treated so well as the whites. They live in camps by themselves, and rude as the cabins of the Americans are, theirs are ruder. Four or five logs laid on top of one another make the walls of John Chinaman's mountain house, and three holes answer for door, chimney and window.

Various devices are used in transporting the wood from

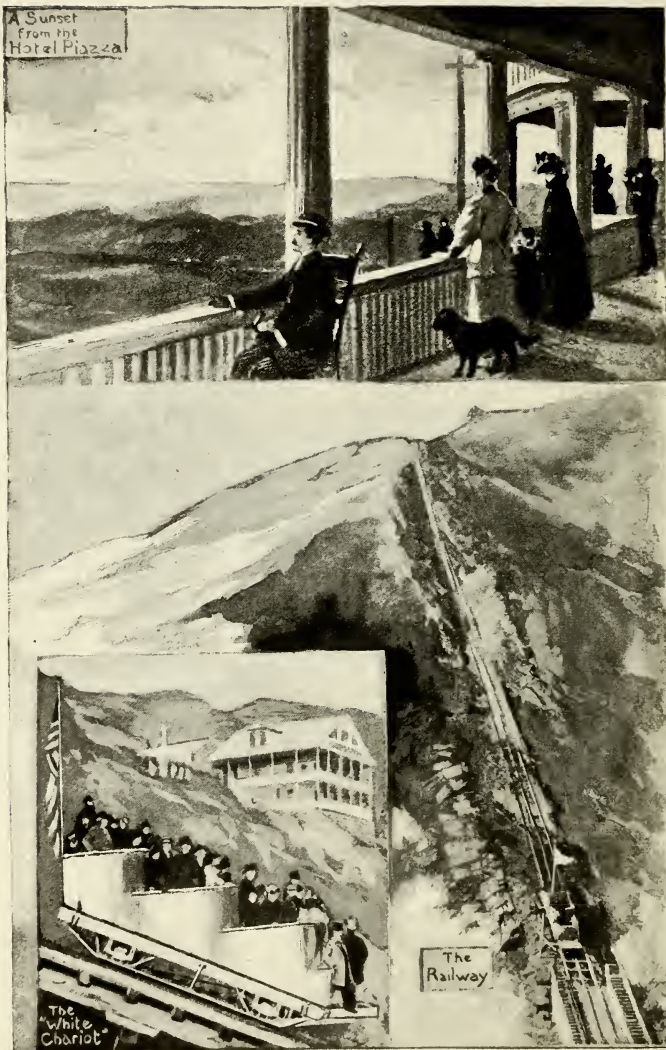
the mountains to the sawmills. I was riding through the Truckee Cañon one day, when a cloud of spray rose from the river above the shrubs on the brink, and I was in some perplexity as to the cause of it before I discovered a sign-board cautioning passers-by to look out for the logs. A trough or slide extended down the cañon-wall, which was almost perpendicular; it was bound with iron bands that shone like burnished silver, and down this the logs were shot with great velocity into the water, which floated them to Truckee town. The fact that the trough crossed the road, and that a traveller might be much startled by the sight of a pine-tree, four or five feet in diameter, suddenly rushing under his horse's nose, made no difference to the lumbermen, who by this simple contrivance were saved the trouble of hauling the wood.

When a wagon is used for conveying logs it is of the peculiar kind shown in our illustration, which represents a load of some seventeen thousand cubic feet, the largest ever transported in California. The wheels of the wagon are circular sections of the pine, convex in shape and bound with broad iron tires. The draught animals are oxen.

The flumes through which the wood from the sawmills is floated to the plains are V shaped troughs. Sometimes they are laid down the mountainside, and then they are bridged over deep chasms on trestle-work supports. One of them is over forty miles long, and cost nearly three hundred thousand dollars to build. The current of the water is considerable, and takes the wood from the summit to the railway at the rate of thirty-five miles an hour.

The large number of men, the enormous capital and the ingenious appliances used make the lumber business of the Sierras very interesting; but no one can help regretting the havoc it is causing in the lovely country around Lake Tahoe.

WILLIAM H. RIDEING.



Echo Mountain.

A Road of the Sierras.

We looked doubtfully at the strange, white chariot, and then at the apparently perpendicular line up Echo Mountain, in southern California, where the cable slid over its succession of wheels. Should we venture on the ascent? The cable looked small and the mountain large, and the end of cable, track and journey was hidden in the clouds.

But for the fear of ridicule some of us would have refused to go higher; we could so easily have returned to the valley below in the same electric cars that brought us up to the foot of the cable road! But the driver or conductor of the white chariot was waiting; so we shut our eyes and stepped into one of the seats.

The conductor gave a signal, and suddenly the bottom began to drop out of everything, and we to rise over the tops of things in general. Awful cañons, big mountains and mighty plains rolled out beneath us; there seemed no reason why we should not continue to rise forever.

Up and up and up! Weights seemed on my eyelids; that horrible cable incline appeared to run from my eyes to my heart; I secretly longed to lie down on the floor, and I am sure the others felt similar sensations.

"We are now approaching the steepest part of the grade, a rise of sixty-two feet in a hundred," came soothingly to our ears; and the dreadful slant seemed to become truly perpendicular. Yet we held to our pretence of decent tranquillity, and were pulled steadily and gently over the crest of the mountain to the level top. There our chariot stopped, as noiselessly as it had started, and we stepped out and looked straight down from Echo Mountain to the world below.

I have seen some of the most famous and beautiful valleys of the world, but they all seem tame compared with the

great, glowing plain of tender green and soft purple which stretched its groves of southern fruit out to a golden, shimmering, distant something which was, we knew, the Pacific Ocean. Santa Catalina Island, sixty-five miles away, shone bright and clear in purple.

After we visited the menagerie on the top of the mountain, we gave ourselves up to gazing on the beautiful scenery, and to watching the white chariots skim swiftly up to the summit, or drop noiselessly over the verge.

Though this Echo Mountain cable road is said to be the steepest, it is considered the safest mountain railway of the world. The contrivance is practically a great elevator. Its ascending and descending coaches, welded to the cable itself, precisely balance, and pass each other at a given point by automatic switches.

As the cable has been tested to a hundred tons' strain, the white chariots when loaded to their utmost capacity are small weights for it. Should anything go wrong with the machinery the chariots would simply stop, and the occupants be enabled to dismount at their leisure. Though the structure looks quite unsafe, it is really perfectly guarded against disaster.

In the power-house the big wheels and revolving cable turn slowly, governed by the dynamo, but the primary force or motor of the cable road is water. Running through a six-inch pipe, and finally through an inch-and-a-half nozzle upon a wheel, it transmits a pressure so enormous that one might better go down the incline without a cable than stand in front of that harmless-looking nozzle. That inch and a half of water is capable of going through the body of a man.

We watched the light go out of the landscape and fade over the Pacific as we sat on the piazza of the pretty hotel, which, with all its refinements of modern luxury, must have travelled up piecemeal in the white chariots. It now sits perched on the very verge of space, a kind of stationary white chariot, itself. Round on the other side were softly

flying the echoes which give the mountain its name, but on our side it was very still.

A little higher up, on a rounded knoll, gleamed the metallic walls of the observatory, which we meant to visit after we had seen the great search-light, on the platform just below us. That long finger of light had come reaching through our windows down in the valley many a night. Its beam makes bright the streets of Los Angeles, twenty-five miles away, and carries a ray to distant Redondo, on the Pacific itself.

Now its ray of light went sweeping across the plain below, resting here and there where a red light signalled for a visit. Down below, that beam had almost dazed us with its brightness; here we could stare into the very eye of the monster without blinking, for the rays do not focus so near.

Away, back and forth, went the finger, now stretching out into a full band of light, now narrowing to so fine a line that it could be but barely perceived. Some spectators with intercepting mirrors caught and flashed a ray here and a ray there, into the shadows of the cañons, on the observatory roof, or back to the hotel piazza.

From watching the light we went to the observatory, which contains a beautiful sixteen-inch glass. The perfect clearness of the atmosphere makes southern California the paradise of astronomers. We had looked through larger glasses, but not at such a height, and the elevation of thirty-five hundred feet above the murky air of the sea-level seemed to bring the stars perceptibly nearer.

We had beheld the sea and the dry land and the heavens; there was nothing else but the wider land of dreams to explore. Since we planned to come forth again at sunrise, we took a parting glance at the constellation of cities on the plain at our feet. It was a fascinating sight, even after the other constellations, and a significant one as well; we could easily forecast the merging of twinkling city with twinkling city, and imagine the time when one great city, stretching from

mountains to sea, will be a chief glory of the country we will still call great.

An unkind fog saddened our sunrise the next morning, so that we were glad to console ourselves by talking with a workman, who looked over the terribly beautiful abyss and said wearily that folks came there and made a fuss about it, but he was sure he didn't see why.

At last we turned our steps toward the chariot, which was kindly waiting to drop us over the brink. This time, instead of the bottom dropping out of things, it was the top of everything which rose and soared away, while we went slipping down through space, until it was in a kind of wonder that we found ourselves above the ground when we stopped.

In eight minutes we were among the ferns and oaks of the cañon; in another fifteen we sped between the fields of wild flowers; in half an hour more we stood in our own rose garden, with the scent of the orange groves heavy about us; and from the tropic of our palms and bananas and lime and lemon we could gaze straight up to the snowy Sierras, and mark a slender white line cutting the purple side, the route of the white chariots.

GRACE ELLERY CHANNING.



California Raisin-Making.

Until within a few years all the raisins consumed in the United States were imported from Europe. It was supposed that they could not be produced in this country because its climate was not warm enough and dry enough, for a season of sufficient length for the purpose. But when, in 1849, California was invaded by American gold-hunters, they not only found the largest and finest grapes growing they had ever seen, but discovered that the surplus quantities left on the vines, after ripening, became raisins!

These raisins were not, however, of the best quality, for the vines on which they grew were such as the Franciscan fathers brought with them from Spain, a hundred years before, when sent among the native Indians who then lived on this Pacific coast.

But enterprising Americans, aided by foreigners from the wine and raisin-making countries of Europe, imported many varieties of the best kinds of vines that could be found. Among these were the white Muscatels and Malagas, from which the best raisins are made.

The white grapes have flourished well, especially in southern California, where the long warm and dry seasons are more favorable for making raisins than further north. The entire absence of rain for the six continuous months, May to November, and almost complete freedom from fogs or dews in many localities during the ripening and drying season, render this the most favorable climate in the world for producing raisins.

The grape-vine here is not staked and tied up, in order to keep the fruit from the ground, as is done in the Middle and Eastern States. It begins bearing the second year after planting the cuttings, and for several years is allowed to trail on the ground, after being cut back each season, so that

the fruit hangs very low, and most of it even lies upon the ground. It is believed to ripen better on the dry, sandy soil than when suspended in the atmosphere, which is always cool at night.

As the roots grow older the main stalk of each is trained to a tree shape, twelve to thirty inches high, and in some old vineyards these stumps have reached a diameter of from six to ten inches. The stumps are trimmed closely every winter or early spring, and from their tops new sprouts spring forth which bear the next crop of fruit. The yield of grapes is enormous, ranging from one ton to two or three tons per acre.

Very few vineyardists manufacture their grapes either into wine or raisins. It requires more knowledge, skill and capital to do either than the mere farmer generally possesses. But the raisin-makers, like the wine-makers, generally own and cultivate a vineyard of from one hundred to one thousand acres, and there is one in Los Angeles County covering five thousand acres, the largest in the world, as a basis of operations, and in addition the owners buy all the grapes that are raised near them by the smaller cultivators.

Several methods of drying grapes into raisins are practised by the smaller cultivators. The following is the most popular, and may be seen in operation at almost every country and village house in southern California. Some time in September or October, small quantities of the finest Muscatel grapes are bought at one cent a pound. Some of the bunches weigh from two to five pounds, so large that they have to be cut in pieces to dry.

They are spread out as thinly as possible, no bunch on top of another, on some sunny porch floor, on the roof of a house or shed, or on trays made of laths or shakes, as the Californians call the redwood clapboards, and placed upon trestles in the yard. Here they lie in the hot sun all day long, and after they begin to color and shrink are generally covered at night with some kind of canvas.

In two or three weeks the bunches are carefully turned

over and allowed to continue drying for another two or three weeks, until they are thoroughly colored and the juice has all evaporated. Thus thousands upon thousands of families are now making their own raisins at a very small cost.

But now for the way in which raisins are made to sell. The grape-grower, if he cultivates but eight or ten acres, can,



Raisin-Making.

with the aid of wife and children, gather his own fruit and haul it to the raisin-maker; but if he is a man of means, and manages his hundred or more acres, he hires a force of Chinamen, who with crooked pruning-knives go through the vineyards, clip off all the ripe bunches of grapes and

place them carefully on shallow trays three by six feet, and four inches deep, avoiding the possibility of bruising them.

These trays, when filled, are gathered up and loaded into two-horse spring-wagons and hauled up many miles into level places among the foot-hills of the mountains to get out of the danger of fogs which often rise late in the season on the lower plains.

Here from fifty to one hundred acres of as level land as can be found has been scraped and rolled smooth. On these fields the grapes are spread upon the ground, by drawing the bottom from each tray and letting them drop gently on their warm bed. They are thus emptied in successions of rows, hundreds of feet long and of uniform width, from dozens of wagons that come and go day after day, from every direction.

Such grape-fields resemble an immense carpet store, where every imaginable pattern of goods is rolled out in the hope of pleasing some fastidious customer. The freshly-laid rows present a light green shade of color. Those that have been down a few weeks have a mottled appearance, while those that are about dry enough to come up have a deeper and more uniform color.

For the reason that the dry soil retains its warmth during the night, grapes dry quicker on the ground than if elevated on boards, and they also more completely retain their flavor. In two weeks the smaller bunches are ready to be gathered up and the larger bunches turned over so as to be dried on the under side. This requires two weeks longer, when they are taken up also. Then follow the gleaners, women and children, who gather up all the loose berries that have fallen off. These are sold as dried grapes.

When the later crop is on the ground, and the first showers are expected, raisin-dryers bring upon the field great rolls of oiled Manila paper; and at night, or when rain is threatened, this paper is spread upon the rows of grapes for the purpose of keeping them dry. This process is sometimes continued until late in December.

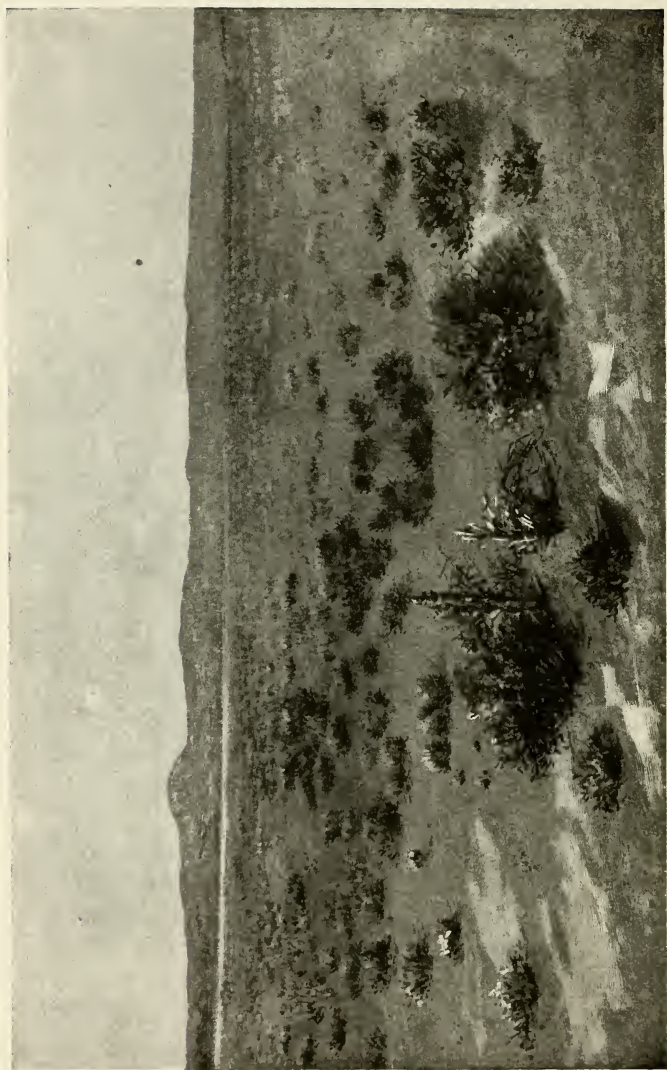
The dried grapes are put into boxes holding about a bushel, and hauled to the packing-house, where they are piled on top of each other as high as the ceiling or roof. In the course of eight or ten days the slight moisture left in some of them, and the heat, cause them to sweat, and this moisture so permeates the whole bulk as to give them a soft and fresh appearance. They are then ready for sorting and boxing. This is done by women and Chinamen, seated, forty or fifty in a room, at long tables.

To each is emptied as needed a box full of fruit; and alongside of each are placed two new, clean boxes, into one of which the largest and most perfect bunches are packed, which are labelled "London Layers," and into the other box the smaller and less perfect bunches, which are labelled simply "Layers," or as some California raisin-makers are now taking pride in stamping them, "California Layers;" while the loose berries are passed through a windmill and cleaned of their stems and dust, and boxed as "Loose Muscatels." Though most of them are the finest berries of the crop, they sell for a much lower price than those adhering to the stems.

Three sizes of boxes are made, one to hold five pounds, another fifteen pounds, but the largest number to hold twenty pounds; and as the boxes are filled heaping full a careful inspector examines and weighs each, taking out any surplus, and passes them to the press-man, who places on the lids and puts them in the press, where they are gradually squeezed down and the lids nailed on.

They are then ready to be shipped to their Eastern and Northern markets by the carload — about one thousand boxes to the car. But as they are not considered perishable goods, like oranges, lemons and pears, they are not rushed off, regardless of demand or prices. The consequence is, they have a steady as well as ready sale at prices which afford a very fair profit to the enterprising manufacturer.

ELIAS LONGLEY.



In Death Valley.

Death Valley.

Death Valley derives its name from the fact that the majority of a party of emigrants who attempted to traverse it perished from thirst and the intense heat. In all probability quite as many would have perished had the party attempted to cross the Mohave or the Colorado desert at any other point, without knowing the location of the few springs and natural reservoirs.

Had the leader known something about the character of the country, or had he taken the precaution to employ an Indian guide to pilot him to King's Springs, it is highly probable the party would have made the trip with no more danger than attends a journey through any part of this region. Knowing the location of the few springs and tanks, or natural reservoirs, one may safely travel through either desert at any season of the year. Without this knowledge, however, it is almost certain death to attempt it, especially in summer.

Death Valley is situated in Inyo County, California. It is a small portion of the desert region which forms a part of the Great Basin. It lies between two low granite ridges, and is the northern extremity of a depression extending into lower California. This depression possesses one remarkable feature: nearly every part is below sea-level. It contains a number of dry lake-basins, one of which, the sink of the Amargosa River, practically constitutes Death Valley.

Another, somewhat larger, is the sink of the San Felipe River, better known as Conchilla Valley. Both stream beds are now nothing but dry washes, though at some former and not greatly distant time each must have carried a considerable volume of water. After the lakes had become dry the saline deposit left by the evaporation of their waters was quickly covered by the dust carried thither by sand-storms, and in a few places only is the deposit left uncovered.

At King's Springs, Death Valley is two hundred and twenty-five feet below sea-level, though it is probable that there are places where the depression below mean tide may exceed three hundred and fifty or four hundred feet. A few miles distant from Dos Palmas, now a station on the Southern Pacific Railway, the writer found a point in Conchilla Valley three hundred and twenty feet below the sea-level; Dos Palmas itself is two hundred and sixty-one feet below.

The reputed volcano in this valley is nothing more than a hot spring, and the alleged eruption consisted merely of a sudden and very large increase in the flow of water, accompanied by ejection of mud. It is probable that a hot spring had previously existed at that locality, and its sudden increase was most likely due to an earthquake.

There are no poisonous gases emitted from the volcanic rocks in either locality; on the contrary, the atmosphere, because of its relative dryness, is remarkably pure. Moreover, in this respect neither valley differs from any other part of the Great Basin, or in fact from any part of the plateau region. Meat exposed to the air will jerk, or dry up, but it will not putrefy. This fact is attributed to the purity of the hot, dry air, which is free from germs and organisms that produce putrefaction.

The most interesting features about Death Valley and its twin, Conchilla Valley, are their excessive heat and dryness. During midsummer the temperature will often remain between 110° and 115° for weeks at a time, and on one occasion a temperature of 130° was recorded at Indian Wells. In spite of its intensity, however, this degree of heat is not intolerable, and one may remain out-of-doors day after day without the slightest danger of sunstroke. Indeed, in this region a temperature of 110° is by no means so disagreeable as one of 95° along the seacoast or in a region where the atmospheric moisture is great.

In these valleys and throughout the desert region excessive dryness is a peculiar feature of the atmosphere, and General

Sherman's assertion that " even the steel rails of the railway track shrivelled and curled up " is a pardonable exaggeration. Water upon the ground disappears almost instantly, and the whole volume of the Rio Colorado would not fill either valley, so rapid is surface evaporation.

Still another peculiarity is the presence of an unusual amount of electricity in the air. Rubbing the hand through the hair will cause a fierce snapping, and in the dark will produce a profusion of sparks. Horses' manes stand almost erect, and their tails are almost globular in shape, because of the self-repellent force exerted by the electrified hairs. In the trading post at Dos Palmas there used to stand a wooden bench on which several hundred cans of preserved goods were kept. The metal of the can acted as a condenser to the extent that at times one could draw sparks an inch in length from the surface.

The rainfall in this region, as in all parts of the Colorado and Mojave deserts, is less than two inches a year ; if evenly distributed over the whole surface of the desert, it would probably be only a small fraction of two inches. But the rain-storms are local, rarely covering more than a few hundred square miles, and when they occur they are apt to come in the form of cloudbursts. There is a sudden darkening of the sky, a deluge of water, and then the sun is pouring its torrid ray on the white, glistening sand almost before one realizes that anything has happened. Possibly more than an inch of rain may fall in less than five minutes, and another cloudburst may not occur in that particular locality in two or three years.

By far more trying, however, are the sand-storms. These come with about as little warning as the cloudbursts, and they are infinitely more disagreeable. During one of these storms the clouds of dust are so dense that the darkness is almost that of night. The finer dust is piled up in drifts fifteen or twenty feet high, shifting from place to place with each storm ; the coarser particles are hurled with a force

sufficient to lacerate and bruise the skin. The fact that telegraph-poles eight inches in diameter have been cut almost entirely away in less than a year may give one an idea of the force of these blasts.

Life, either animal or vegetable, does not thrive in either valley. There are a few species of cactus and one or two of lizard. The cacti, judging from the number of dead plants, seem to be succumbing to the intense heat and drought. One species of lizard is a beautiful, graceful and agile little creature that emits a musical chirp; the other is the famous horned toad. Inasmuch as there seems to be neither water nor insects for them to subsist upon, just how they live is a mystery. Several of the latter, made captives by the writer, lived for nearly five months, apparently on nothing. No amount of coaxing would induce them to eat insects or bits of shredded muscle, yet they seemed lively up to a few days before dying.

JACQUES W. REDWAY.



The Queer Surface of Nevada.

The State of Nevada has very few inhabitants, and is commonly supposed to be a desert that ought to be avoided by men who wish to establish homes. Yet its vast area is rich in many ways, though considerable portions of it are given over to freaks of nature—deserts, plains, sinks and ugly eruptions. But the State can well afford room for its queer spots, as it has, exclusive of them, enough fertile soil to overlie the whole of New England.

The traveller who crosses the “Sage-Brush State” in the cars sees much of its dreariness and little of its pleasant places. He does not suspect that Nevada has great stretches of valley wherein are ranches and cattle ranges, and lazy rivers winding through broad, bright ribbons of green.

Indeed, water works emerald miracles in this strange land, and there the farmers reap easy and sure harvests. Their fields pay abundantly in hay and grain; their herds furnish ample measure of milk, butter, cheese and beef; their flocks produce well of long, wholesome wool, and their orchards bow down with loads of fruit.

The surface of the state is about five thousand feet above the sea-level, on an average, the range being from three thousand feet, in some of the valleys, to ten thousand feet, where snow-clad peaks lift into the deep blue vault above. The aspect of the whole is gray, because sage-brush covers nearly the entire extent, and the surface is a varying succession of mountains and valleys.

At various places occur alkali flats, some of which are readily reclaimed, while some are veritable deserts, almost as white as snow, flat as a table, and barren as the bottom of a sad-iron.

Some of these flats are forty miles long and ten to fifteen

miles broad. Over them the winds blow blinding, parching clouds of smarting dust. On the edges of such "blisters" springs frequently gush forth, but the water is brackish and often poisonous.

Beneath these chalk-like floors riches sometimes lie. Men



Queer Surface.

dig trenches near the edges and fill them with water. The sun dries them out, and behold! a fine crust of crystal salt, pure and clear. Or, again, there may be borax deposits, and laborers plow or dig out the cotton balls of borax, grind

them up, crystallize them, and get rich from the sackfuls and tons of it carried into distant cities.

The state is wonderfully and richly endowed with springs. To say nothing of snow-chilled, rock-filtered founts of pure water, there are hundreds of freaky spoutings, both cold and hot, some of which have attracted the attention of science from afar. I doubt if any like area contains so great a number of hot mineral springs.

Sulphur taints some so thickly at times that the bottoms of the ponds are formed of the grayish stuff, and every submerged twig and root is coated heavily with it.

The hot springs, however, which are found in almost every valley, are the most attractive. These gush up in many sorts, but nearly all are said to possess healing qualities and are exceedingly pleasant to bathe in. There are six or eight of them within a short distance of the capital city, Carson.

One of these, Steamboat Springs, is famous in the scientific world. The waters spout, small, geyser-like, from deep rifts and chasms, making much to do of it and rumbling mightily. Where the heated and agitated fluid issues forth it drops a burden fetched from afar down and leaves it, red and heavy, at the outside door. This deposit is cinnabar, or quicksilver ore, and is regarded with great interest by geologists.

Another strange feature of Nevada are the sinks in which its rivers disappear completely. The Carson River, the Humboldt River and the Truckee River, not to mention small streams, flow their life-imparting way to apparent lakes, which are really huge sinks. Carson Sink, Humboldt Sink and Pyramid Lake, respectively, swallow down the whole output of the mountain springs.

Fish live in these uncanny lakes, and ducks and geese gather in thousands on them, but the water is a little off taste. Some much-learned heads shake wisely, and assert that subterranean passages conduct the streams away.

In this wonderland are caverns that rival the great Mammoth Cave of Kentucky; beds of salt where slabs may be

quarried out like stone ; deposits of sulphur as pure as can be made in the underground laboratories ; ledges of mineral soap that may be cut out with a knife, and countless combinations, chemical and curious.

There are vast treasures of metal, gold, silver, copper, lead, iron, and those the names of which are much less commonly known.

There are beds of coal, forests of trees and acres of sand intermingled with gold in flakes. These sands are the placers, and it is not easy always to separate the precious bits of shining metal from the dross.

There are mountains of granite, sandstone and marble, not to mention the volcanic and igneous formations. Quarries of all of these rocks are worked a little, but so extensive is the supply that the present working might be compared to the scratching of one hen on a large farm with design to cultivate the acres. The granite is close-grained, of all tints, and of much beauty ; the marble is of infinite variety, and fit for the finest of the arts.

Some wonder-inspiring "footprints on the sands of time" are found in the stone quarries at the state prison, near Carson. There they were left ages ago by birds and animals long since extinct. Grave professors have hovered lovingly over these mud impressions, and they pronounce them wonderful.

Weird animals and birds wandered along that place, then a lake shore, while yet the mud was soft as ooze, and there left their autographs ; and Nature came to save the page, and she shut on it her cover of rock, hard-wove and thick and lasting as the hills.

PHILIP VERRILL MIGHELS.

Pyramid Lake.

The volcanoes of the Pacific coast, in their extinction, have left us no more wonderful phenomena than the deposits now seen in a wonderful sheet of water known as the Pyramid Lake, in Nevada, over three thousand feet above the sea-level.

This lake lies near the eastern base of the Sierra Nevada Mountains, about one hundred miles south of the Oregon line. It is nearly forty miles long, by five to twelve miles wide. Jutting out of its waters and rising abruptly up from their very depths are hundreds of pyramids, or conic formations, of a basaltic mineral; they are not of stone proper, but the evidence shows that they were once molten matter thrown out in the upheaval of a prehistoric volcano. Whether or no the area of the present lake was once the crater of a volcano, or whether the crater was near by, throwing its jets of lava into the cooling waters, are problems that are well-nigh indeterminate. Doubtless strong testimonies could be produced in favor of either hypothesis.

The tallest of the pyramids in the lake are said to be some five hundred feet high—about as large and as high as the great Egyptian Cheops. The smallest appear to be from ten to fifteen feet in height. They are seen singly, and in groups or clusters, irregular in height and irregular in diameter, but all of singular uniformity in shape—like an ordinary V inverted, the angle acute at top, the apex pointed, and usually very sharp at that.

Some of the pyramids are hollow, having apertures in the sides through which otter and other fish-eating quadrupeds go in and out. There are thousands of these fur-bearing animals seen sporting about the pyramids. They are careful, however, to make their homes out of reach of gunshot from the shore.



Pyramid Lake.

The lake abounds in the finest of fish, chiefly of the trout and salmon family. The waters of this and its twin brother, Winnemucca Lake, lie within the bounds of an Indian reservation in Nevada, and the fish are the exclusive property of the tribe of peaceable savages living on the shores. White men are not allowed the privilege of fishing in the lakes, except by the grace of the Indian, and that means both little and much — little of the grace, and much of the consequence if you happen to be caught! You may catch a few of the fish for your own personal use, but if you are found making merchandise of them, woe to the fisherman!

The provident Indian — for there are a few of them there — spends some of his time during the summer days in taking the fish and drying them for winter use. The fish are cut open and hung, or laid, on scaffolds erected on the shore. The hot sunshine over the white sands of the beach soon dries the fish ready for packing away, the reflection of the heat from below being almost as great as the direct rays from above.

The waters of this lake, like those of Great Salt Lake in Utah, are never at rest. They are always, as I was told, while there, in a state of agitation and unrest. It is indeed a troubled sea, though its waters are fresh. Navigation over its surface is ever attended with supreme danger, and even the Indians rarely venture far from the broad, white beach. Few white men have ever succeeded in crossing in boats or canoes; many have been lost in attempting the feat. The winds sweep the lake with sudden and frequent squalls.

The Indian name of Pyramid Lake is written *Cuh-o-wah*, or *Coo-ho-wah*, a word that in the native tongue means simply waters, or the big or much water. Lying by its side is the Winnemucca, the great purple water. These lakes are the reservoir holding the waters of the Truckee River, a raging, roaring stream that leaps in considerable volume from the canons of the eastern face of the Sierras, fed by the eternal snows of the dizzy summits that rim the heavens away to the westward.

Up the northern bank of this river the Southern Pacific Railway winds its course, past the sombre shades about Lake Donner, up to the crest of the mountain at Summit Station. The mountains about the Pyramid Lake are low, sandy and quite barren. To the northward is an ugly stretch of desert, and one of the roughest highways over which human traveller is ever hurried by pitiless stagemen.

There are no waters of Nevada that have an outlet in the ocean excepting some small tributaries of the Snake on the north, and one of the Colorado on the south.

The principal river is the Humboldt, a current that winds through a desert, without a sprig of verdure to mark its shores. For a hundred miles one may travel not more than half a mile from its course and never know that there is a stream of water near. The banks are low, and in places the desert plain stretches away in unbroken level for more than a hundred miles. With the occasional exception of sage-brush and bunch-grass, nothing grows on this desert plain except in irrigation.

Humboldt River has no lake or sea outlet; the waters, after running nearly a thousand miles, simply disappear and lose themselves in a vast sand and alkali basin known as the Sink of the Humboldt, in one of the dreariest and most forlorn stretches of waste land human eye ever beheld, in the heart of a great broad plain shimmering with sickening, whitish alkali, while the far-off mountains to the southward appear like a vein of silver, with their snow-capped faces looking down on the desolation below.

M. V. MOORE.

The Grand Cañon.

Having read several interesting accounts of visits to the Grand Canon of the Colorado River in Arizona, but none describing the experience of a descent into the chasm, I was filled with a desire to have this experience.

I was told that to make possible a descent to the river, the services of a guide would be necessary; but deeming the price which the local guides asked beyond my means, I resolved to go alone.

As I stood on the rim of the canon, ready to begin the descent, I must confess that I felt a little uncertain of the wisdom of my course, but I had no notion of turning back.

Mr. John Hance, who lives in a cabin near the rim of the canon, told me that the distance from the rim to the river was seven miles; the vertical depth more than six thousand six hundred feet; the distance from the rim to a cabin on the trail, three miles; vertical depth to the cabin, four thousand feet; length of longest rope, fifty feet.

With neither coat nor waistcoat, carrying only my journal and my lunch, I was ready for the descent. I noted the time, which was just seven o'clock and forty minutes, and bade good-by to my driver, requesting that if I should not return by the afternoon of the next day he should come down to seek me.

The trail is so steep that one can scarcely keep on his feet. I walked, ran, slid and rolled down the three miles to the cabin in just an hour and two minutes.

The scenery all the way was exceedingly interesting. Looking down, one would see a prominent ledge, or bench of rock, perhaps a thousand feet below, from which would rise a magnificent butte. A quarter of an hour's travel would bring him to a level with this base; and in the next quarter of an hour he would see it rise a thousand feet above his head.

I found it exceedingly interesting to pick out prominent points, both at a level with me and far below, and then stop occasionally and see how we had changed position. In fact, I think that is about the only way one can gain an idea, inadequate though it be, of the great descent he is making.



The Grand Canon.

At the cabin I found a beautiful stream of clear, cool water, which was very refreshing. Here I divided my lunch, leaving some for my return. After half an hour's rest I pushed on.

The canon here, which is merely a side canon leading down to the river, was perhaps five hundred feet wide, with walls nearly vertical, a thousand feet high. On every hand the scenery was indescribably grand. The canon was narrowing, the walls were getting higher; the whole scene was becoming more impressive and majestic.

The indications of the trail were growing exceedingly faint. I had gone perhaps three miles from the cabin. The canon had narrowed to about twenty-five feet, with its walls sloping at an angle of over eighty degrees.

I had descended through the sandstone and shale, and was already several hundred feet into the granite, when I came to the first rope ladder. I was glad to see it, for it assured me that I was on the right trail, although it brought visibly before my mind the fact that the dangerous part of my journey had yet to be accomplished. The ladder was about ten feet long. I tested its fastenings and easily descended.

A few steps beyond, I had to climb by a single rope over a ledge of vertical rock fifteen feet high. As I had no means of examining the fastening, I hesitated for a moment, for I knew the hardest strain would come upon the rope just as I should round the top of the ledge and be farthest from the rock below. I ascended safely, and then soon had to descend a gentle slope, clinging to a rope about forty feet long.

When I had gone about one hundred feet, the canon had narrowed in one place to a width of about five feet, and at the bottom was a pool of water about eighteen inches deep. The walls were so smooth and round that it was impossible to pass the pool without getting wet. Removing shoes and stockings, I got over nicely, and as I expected to meet even a worse case in a moment or two, I proceeded with bare feet on the smooth granite.

Turning a sharp angle in the canon, I had scarcely gone forty feet when I heard the roar of a heavy fall of water, and found myself hemmed in on both sides by steep walls, with a waterfall about fifteen feet high in front of me. On the level

of the rock below the falls I saw a bunch of rope lying against the wall of the canon, as if it had been washed there.

I at once supposed that I had reached the end of my journey, and that the rope which I saw had at one time been used to get over the falls, but was now out of reach. Nevertheless, I decided to see what I could do toward climbing around the place.

The granite was very smooth, but, being barefoot, I found climbing rather a simple matter. I was getting along nicely and congratulating myself that I had got safely around the falls, when, to my horror, upon turning to the left, I saw below what at first appeared to be a descent without bottom.

Climbing to the edge of the precipice and looking down, I concluded that this must be the great waterfall of which I had heard Mr. Hance speak, and that the rope I had noticed from the precipice, now behind me, had not fallen down from that, but was intended for this next descent.

Making sure that the end of the rope was well fastened, I cast it over the falls. It hung straight in the midst of a cascade of water four feet wide and six inches deep. The rope appeared to be strong, and I determined to try it.

The height was said to be fifty feet, but I think it was not so much. As I did not wish to have my watch and my journal ruined, I hid those articles with my trousers. As I was concealing them it occurred to me that no one was within at least six miles.

Below the falls there was a spot about ten feet square, perfectly dry. Down upon this I tossed shoes, stockings, shirt and lunch. My underwear I retained, to protect myself in some measure against the rocky wall. The descent through the falls was pleasant enough, the water having about the right temperature to produce an exhilarating reaction without chilling; and as I passed down the rope I was delighted, as well as surprised, to find the wall covered near its base with beautiful moss and maiden-hair ferns.

Removing my wet apparel, I put on what dry clothing I

had, and went on. I had gone about two hundred feet when I came to a place that troubled me. It was a slope, somewhat steep, but quite smooth, and no rope was in sight.

Examining the place carefully, I decided that the best method of descent was the one I had used years ago on my grandfather's farm in descending straw-stacks. Only one objection presented itself—the part of my costume that was missing is the one usually most relied upon on such occasions. Nevertheless, I conformed to the inevitable, and slid down without serious injury.

Only one short rope remained for me, and, almost leaping with joy, I found myself on the bank of the Colorado. The river was an angry, muddy torrent, with rapids at short intervals, flowing between rugged granite walls that rose almost perpendicularly from the water's edge.

It seemed impossible to pass more than one hundred feet up or down the stream; and as I sat in the shadow of a mighty boulder and enjoyed my battered lunch, I thought of Major Powell and his party, who passed through here in 1869. My wonder was, not that two members of the expedition had been lost, but that any should have escaped.

Having looked upon the scene until it became deeply impressed upon my memory, I gathered a few pebbles to carry with me and started on my return. The sliding-place was soon passed, such places being, on the whole, more easy of ascent than of descent.

When I reached the base of the high falls, I removed all my clothing, even to shoes and stockings, and thrust everything except my belt into the bag in which I had carried my lunch. Fastening the belt to the bag, I buckled it around my neck. Then stepping into the midst of the falls, with my face turned upward, so that my nose should serve as a watershed, the bag hanging under my head, I ascended the rope and reached the top with my clothing only slightly wet.

The things I had hidden I found all right, and as I stopped for a little rest I wrote up my journal.

I reached the cabin at four o'clock. I called to mind that I had been told that the ascent from there would require at least three hours. At that time of the year it is dark at half-past seven; so I concluded that if I started I must climb the whole distance in the time mentioned. I determined to go on, and not to look at my watch until I had reached the top.

The distance is three miles; the elevation is said to be four thousand feet; and it was just half-past four when I started. In the first mile I do not think I ascended more than five hundred feet. That was covered with ease, and then I pressed on to the steeper part. After climbing hard for a while I sat down to rest.

As I sat there, I remember looking up at some turret-like projections of rock on the rim, several thousand feet above me, and saying: "Well, I guess about four such pulls as this will bring me out."

I struggled on. Each interval between my rests was growing shorter, both as to space and time. The number of rests was nearer forty-four than four, and by the time I had reached the top I was so completely worn out that a pull of a few yards was enough to bring me to a halt.

A dark shower which was raging on the rim had deceived me somewhat as to the hour; I supposed that it was later than it really was. As I threw myself on the ground under a piñon-tree on the rim, my heart beating at the highest speed and my flesh aglow, I looked at my watch. It was just twenty minutes past six. I had come from the cabin to the rim in just one hour and fifty minutes.

As I dragged myself to the door of Mr. Hance's cabin, the old man met me. He was unwilling, at first, to believe that I had reached the river. I told him of my experience on the ropes, and he was convinced. It is unnecessary to mention that I slept well that night.

J. G. OWENS.

Cave-Dwellers of Arizona.

Arizona has an unwritten history which may be roughly surmised from the rude characters inscribed on rocks, the deserted dwellings of a prehistoric race, and the ruins of once populous towns. All these things give evidence that a peaceful, industrious people, cultivating the soil and practising some of the arts, had lived and died within the territory centuries before the European saw this continent.

This aboriginal people passed away, leaving the wild Indian and the buffalo in possession of their domain; but some of their works have withstood time, and remain to aid us in guessing their history. Who they were, whence they came, whither they went, are problems not yet solved.

Traces of these people have been discovered in New Mexico, Utah and Colorado, but in those districts the ruins consist mainly of crumbling walls, mounds of dust and masses of rubbish, the remains of old buildings. The most authentic history comes from the Great Tonto Basin in Arizona, comprising upward of ten thousand square miles. Here nearly every eminence bears ruins that prove the ancient existence of a vanished race.

Under the shadow of the Rocky Mountains flows a small yellow stream called Beaver Creek, a tributary of the Rio Verde, which runs into the Gila River. On the creek's high banks are located upward of sixty walled caves of various sizes, once the homes of that prehistoric race of whom the American Indian has no traditions.

The caves vary from five to twenty-five feet in depth. Their entrances are walled by heavy masonry of stone and cement, still in good preservation.

The largest of the caves are divided into many small apartments by partitions, or walls, of stone and cedar wood.



An Arizona Cave-Dwelling.

It is asserted by many students of the race that the inhabitants lived in the smaller apartments, securely fortified from enemies who frequently besieged their cave-towns.

The dwellings consisted of an upper and lower cave. To reach the upper cave it was necessary to ascend by outside ladders, at peril of falling to the ground, sixty to one hundred feet below. The lower cave was reached by climbing over the rugged edges of projecting rocks.

To the walls of the rooms still hang small fragments of mortar, proof that the interior of their cave-dwelling was plastered. From discernible imprints of hands and fingers, it is surmised that the mortar must have been spread upon the walls with bare hands. In many places can be seen the impressions of the small, chubby hands of little children, who were, no doubt, delighted to make their marks in the wet plaster.

Many of the caves are equal in size to some of our public buildings, and in one of the largest ruins five hundred rooms were found. Four stories still stand, but the roof and upper walls have long ago crumbled and fallen to the ground. The rooms are still well preserved. They have no other entrances than small windows, for the buildings were entered by ladders which rested in niches in the walls, and which were drawn in after the occupant.

Floors were formed of cedar logs laid close to each other with spaces between them filled in with twigs and cedar bark. The ragged ends of the logs give evidence that they were hewn by dull instruments, perhaps by the stone hatchets and saws which we saw lying about.

Many cave-dwellings erected in proximity to each other formed what was known as a cave-town. A plaza was set off in the centre, and the rooms were arranged around it. The architecture of each seemed to have corresponded in the minutest detail to that of every other, so that all the dwellings of the town were alike.

The walls of the cave were from three to four feet in

thickness, and the roof covered with timbers of cedar and dirt over a foot thick. Often these cedars are found well-preserved, and this has often caused doubt of the great antiquity of these ruins. No such doubt is felt by those who know that the cedars of Colorado and the Southwest never rot, but die standing without support until borne away on the winds in atoms of fine dust.

Cave-towns were often built in the form of a square and parallelogram, as well as in a circular form, and their measurements were exact in every detail. Their masonry reveals a higher state of civilization than that enjoyed by the Mexican or Pueblo Indians.

The circular towns consisted of three tiers of cave-dwellings, one directly above the other. The second tier receded some distance from the ground tier, and the third receded from the second. So the whole resembled a huge stairway of masonry and adobe. These tiers ran all round the enclosure, and thus formed a stronghold for defence during troublesome periods.

Among the great structures now crumbling to dust must be mentioned the *Casa Grande*, situated in the valley of the Gila. Its history antedates the time when the Spaniards conquered and occupied the country.

This wonderful building stands a short distance back from the Gila's banks. Its origin has been traced back on good evidence through five centuries. When first seen by the white man, three hundred years ago, the largest building was four stories high, and had walls six feet thick. At the beginning of the present century one house alone remained, which was four hundred and twenty by two hundred and sixty feet.

The walls are of concrete, consisting of mud, gravel and hard cement, while the interior is coated with cement, and is hard and smooth at the present time. The ruin has diminished in size until it is now fifty by thirty feet, and is rapidly sinking to a mere hillock of dust.

The inside is divided into five rooms, the central one being

eighteen feet long and fourteen feet wide, while the others are twenty-five feet long and ten wide.

The beams of cedar still inserted in its walls give proof that the building originally had four stories, with a fifth located above the central part. No stairways nor traces of any can be seen, so that, as in all of the cave-dwellings, the upper rooms must have been entered by ladders.

In all the ruins are circular apartments, surrounded by walls of masonry sunk deep in the ground. These circular chambers have an average diameter of twenty feet. They were used for worship. The cave-dwellers were probably sun-worshippers, and within this peculiar apartment were performed the rites of their religion.

In connection with the cave-dwellings have been found numerous hieroglyphics engraved on rocks centuries prior to the landing of the Pilgrims at Plymouth. That they are of great antiquity, and were engraved by men of no little intelligence and ambition, can hardly be doubted.

Without exception the sites chosen for the erection of cave-dwellings were in the vicinity of agricultural lands, and the existence of artificial canals gives evidence that irrigation was practised by their owners.

One canal, ten miles long, twenty-five feet wide and ten feet deep, still exists, and was no doubt designed to receive the waters of the Gila for distribution to the cultivated fields, in which they raised Indian corn, pumpkins, melons and certain fruits. Another irrigating canal has been followed to the Gila, a distance of forty miles.

There have been found in the cave-houses more than two thousand pieces of pottery, from large, coarse jars to cups and jugs which might well be coveted by bric-à-brac collectors; hundreds of stone hatchets, knives, arrow-heads, hammers and mortars; bows, paddles, hoes, lances and plows of wood, and mantles woven from yucca fibre, wild cotton and the inmeshed feathers of turkeys—for there is abundant evidence that the cave-dwellers had domesticated the turkey.

The high, dry recesses of the closed houses have preserved not only the bones, but the burial-clothes in which the people were wrapped and laid to rest in carefully walled-up niches of the crags.

The skulls give evidence that the cave-dwellers possessed average brain capacity. The skeletons show that the men were sometimes six feet in height, and the women five feet seven inches. The soft, reddish brown hair of the women is neither wiry like that of the Indian, nor kinky and black like that of the negro, but fine and straight.

The remains, indeed, indicate that these denizens of pre-Columbian America may have been comely women and strong, intelligent men.

Surely, from their homogeneous character, beauty, and precision in detail of construction, we must believe that the cave-dwellings and the domestic articles found in them are the work of a great people, whose civilization was of a higher order than that of the tribes which have succeeded them.

PRESTON H. UBERROTH, U. S. R. M.



A Buildded Lake.

A reservoir of water for mining purposes or the irrigation of land usually costs vastly more in money and in time than any one would think of devoting to such an undertaking, if nature could be trusted to send rain enough for the work intended. But in a large portion of the far West of the United States rain comes seldom, and when it does fall the time is winter or early spring, though the water is especially needed in summer. It comes in torrents, rushes down the mountain-sides, roars into rocky canons, and vanishes, leaving its traces only in washed-out mountain trails, countless gullies and undermined railroad tracks.

The plan of water-storage is to catch the water as it falls in the winter-time, store it up in a huge reservoir, and use it for irrigation in the summer season.

The site of the lake-basin should be shut in by hills, with an outlet through some narrow cut in the rocks, as at the mouth of a canon, which can be easily closed by a dam. The area drained by the lake should be as large as possible, so that the water-supply may fill the reservoir every year. Then, too, if the water is to be used for irrigation or mining, the dam must be built somewhere near the ground to be worked.

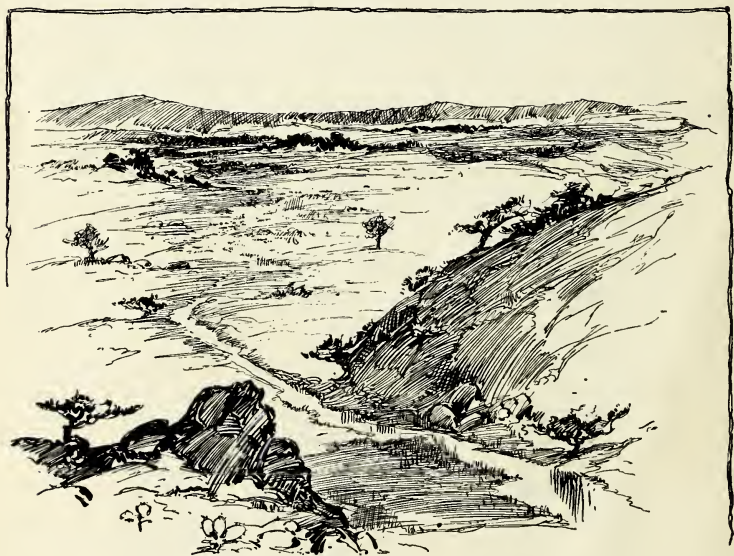
The simplest way of locating a storage-lake would be to discover some ancient lake-basin and close its outlet, precisely as was done in building the reservoir at Walnut Grove, Arizona.

The dam at this place stands one hundred and ten feet high above bed-rock, and is four hundred and ten feet long across the top. It is a huge wedge of stone, built up of four hundred and fifty thousand cubic yards of rock, and sealed by an apron of three-inch planks, calked and painted with asphalt, as stanch as the sides of a ship.

At the beginning of the work Walnut Grove was in the

wilderness, fifty miles from any place, but a town sprang up quickly about the site. Hundreds of men were constantly engaged on the job, all the day and all the electric-lighted night, for nearly a year, during which time no rain fell. This unusually long absence of rain was a great source of good fortune to the builders; but when all was completed we anxiously desired a flood, that the great structure might be tested.

We grew impatient and began to doubt whether such a

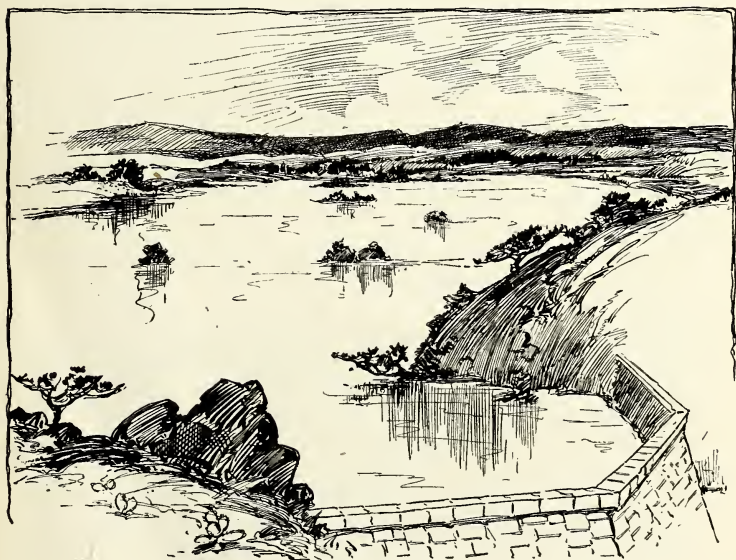


The Valley.

brazen sky could rain, and whether, if it did, all the water in the territory could fill that immense lake-basin, which lay parched and lifeless beneath the blistering Arizona sun. Indeed, the outlook seemed dubious enough. There lay the outstretched water-basin, a very desert in barrenness, its red volcanic soil aggravating the sense of aridity derived from

seeing the lurid heat. In the basin were brown grass, brown rocks, stunted oak-brush, withering cactus, cattle dying on the road to water, the only water in sight a sluggish creek winding through the valley and sinking, at intervals, out of sight beneath the sand.

The flood-gates had been closed three months in expectation of the rains, but winter had come and gone without even a sprinkle. Heavy snow had lain on the mountain since February, but no rain had fallen to bring the snow down in a



The Lake.

freshet. At last, in April, came a driving wind and rain, blown in from the Gulf of California.

Rain-drops as big as marbles bounded from boulder to boulder and down into the lake-basin. Every groove in the rocks fed a hollow, the hollows fed the streams and the streams quickly grew into torrents that tore their way through

the empty creek-beds. The lake-level rose three feet in an hour, but the effects of the warm rain on the mountains had yet to be seen.

At midnight a cowboy rode in on horseback, breathless with excitement, to tell us, "There's a wave from fifty to a hundred feet high crashing down the valley!"

We seized our pouches and lanterns and started for the boom. We could hear the roar of the river, ten miles away, but it was an hour before it rushed in upon us, twenty feet high and fifty feet across, a great tidal wave, seething with foam, carrying trees, boulders, everything before it. Then followed the deafening boom of the other creeks, as one after another they came down.

We hurried back to camp, to find our approach nearly cut off by the rising water. Everybody was awake and rustling. The croakers, who had built on the flat in defiance of the dam-level, were scurrying about in the dark, scooping their belongings into gunny-sacks and rushing up the hill to establish new claims above the one-hundred-and-ten-foot line.

By morning the rain-gage showed a rainfall of two inches, but this gave no clue to the rise in the lake. We looked out at daybreak to find the face of the country entirely changed. The rocky water-basin of yesterday was now a lake, three-quarters of a mile wide, a mile and a half long and eighty feet deep by the dam, on which floated logs, tree-trunks, fence-rails and islands of sawdust that had drifted down from the sawmill above.

Roads, trails and cabins had disappeared. We found ourselves entirely at sea, and had to look off repeatedly to the distant mountains to find where we were. Even the cattle looked confused. Being used to a swallow of muddy water from the creek, they stood appalled at the ocean that lay before them, and refused to drink.

The change in the landscape was too sudden to realize at once, the smooth expanse of water being so striking a contrast to the rocky water-basin it displayed. We had known

beforehand exactly how high the lake would rise when the dam was full, but imagination had not pictured to us the beauty and variety of the constantly changing outlook.

As the lake-bottom sloped very gradually upward, a slight increase in depth added greatly to the size of the lake. Hillsides disappeared under water to become shelving beaches and fine swimming-grounds, rocky cliffs became islands or steep promontories, curves in the creek-beds made peninsulas, valleys between the hills became bays, all changed as by magic when the water rose.

It continued to rise for three weeks longer, until the lake stood one hundred and five feet deep, covering seven hundred and fifty acres. The débris on the surface gradually sank, leaving the lake surprisingly clear and blue, like a translucent amethyst in its setting of terra-cotta hills.

HELEN FRANCES BATES.



The Oldest American Houses.

Santa Fé is said to be the oldest city in America. That the statement is not true would be hard to prove, because the question of its origin and age is wrapped in mystery.

When Coronado explored Mexico in 1540, he found many Indian pueblos on the Rio Grande River, and speaks of several which must have been near the present location of Santa Fé. The one which it is generally supposed was on its precise site at that time stretched along its river-banks for six miles. Coronado reported that he found here a beautiful and fertile valley, under high cultivation by the Indians.

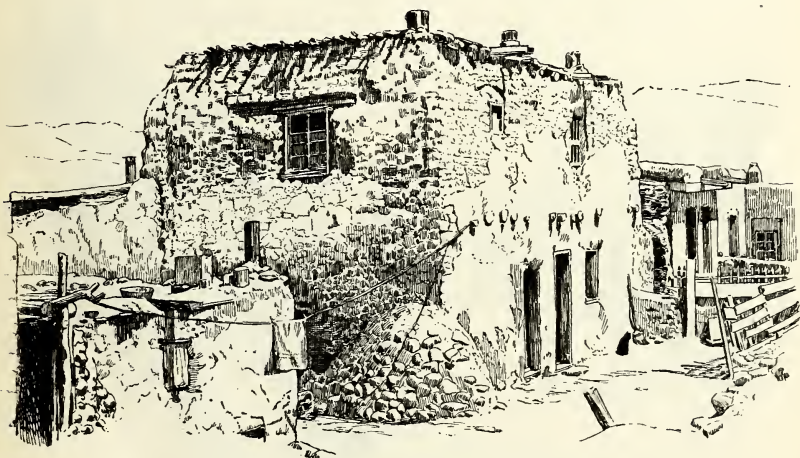
Visiting Santa Fé to-day it is hard to realize, ancient as the old ruins look, that one can really be gazing on walls which Coronado saw nearly three centuries and a half ago.

It is still harder to realize what must have been the oppressions and cruelties which have brought about the present degraded and wretched condition of the Indians whose ancestors formerly occupied and cultivated the whole valley. That a race which, over three hundred years ago, had reached comfort and success in agricultural and pastoral occupations, should be to-day an abject, supine, wretched race of beggars, is a melancholy comment on the injustice they have received. They did not sink without struggles.

Santa Fé, being the seat of government, was always the point of attack, the chief centre of strife, and very terrible scenes have been enacted there. As late as 1837, a Mexican governor who had ruled with great severity and laid oppressive and unjust taxes on the Indians' crops, was murdered by them under circumstances of tragic horror.

The struggle which took place at this time was the last the Indians made. They were soon subdued, and remained peaceable till they came, with the rest of the New Mexico citizens, under the government of the United States in 1846.

There is still standing in Santa Fé one building which has been the home of the most prominent persons, and the scene of the most important events, through all these vicissitudes of the city and its government. It is still called, as it was called three hundred years ago, "The Palace." Anything less like a palace could hardly be conceived of. It is a low adobe building, one story high, with a veranda running its entire length. It makes the north wall of the plaza, and in it are still the governor's home and all the offices of the



The Indian House.

government; the United States and territorial court-room, libraries, Congress halls, etc. It has been so often repaired that it has lost much of its ancient look, but the massive walls and heavy hewn beams remain unchanged, and will, no doubt, bear their mute witness to its antiquity for a century or more to come.

The plaza on which it fronts is two and a half acres square, well-shaded, provided with seats, and, commanding a view of all the life there is in the town, it is the best possible point from which to gather an impression of Santa Fé.

Sitting there, looking at the governor's old palace on the north, and the row of smart Jew shops on the south, at the low and half-crumbling mud-walls and houses, and the big new brick and wooden buildings cropping out here and there, and overtopping everything, one sees an effective picture of the clashing of the new and the old.

It is the new that suffers most by contrast. The long, low adobes, with their lines of absolute simplicity, and their soft yellow-gray color, seem far more dignified than the modern



Street in Santa Fe.

wooden building, or even the substantial brick one, with copings and facings of different colors. Contrasts no less marked will be seen in the passers-by in the streets. The successions are almost fantastic.

Close on the heels of two dapper young Americans in a buggy, with surveying instruments and charts in their hands, comes a Mexican cart, creeping along, drawn by oxen; its wheels are circles of solid wood, sections of tree-trunks,

roughly hewn, with an irregularly-shaped hole in the centre, in which creaks the rough-hewn axle.

The driver is in rags and dirty, but he wears a fine broad-brimmed sombrero, with a roll of twisted silver wire and straw around the crown; and as he goes he sings a lilting song to himself, or whistles softly, or takes a nap in his cart, and he would not change places with the hard-working young surveyors if he could.

Sauntering through the plaza, and looking curiously, with furtive glances, at strangers, come his sweetheart and her friend. They wear trailing cotton gowns, sweeping a foot behind them, and begrimed half-way up the skirt with the impalpable, ineradicable Santa Fé dust; they would feel humiliated to lift them, and to wear them short would be disgrace.

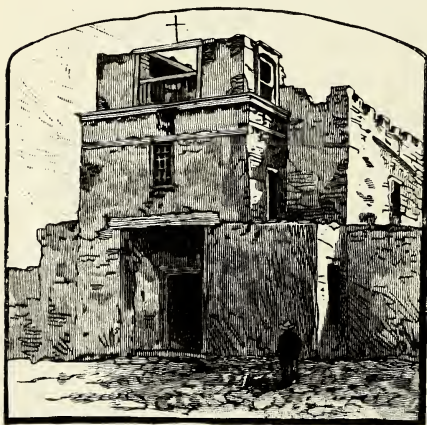
To be unconscious of dirt, superior to it, is dignity. On their heads they wear gay shawls, black with gaudy flowers, or white striped like a rainbow. With one hand they hold the shawl-folds firm over their mouths, their soft, but passionate black eyes gleaming out of the triangular opening above, as from the bars of a prison-window. They are used to only half-seeing; for the few windows they have in their houses are without glass, and shut off from the street by jail-like gratings of close-set wooden rails.

Behind them comes, with brisk step and erect carriage, an American woman, the wife or sister, perhaps, of some officer of the fort garrison. She is dressed in the last Paris style; nothing escapes her eyes; as she passes the sauntering Mexican damsels she glances disdainfully at their dusty trains; and they in turn speak scornfully to each other of her needless uncovering of her ankles.

In a few moments, to complete the human panorama, there go stalking along outside the plaza paling a group of Pueblo Indians, bareheaded, wrapped in scarlet blankets. The dignity of their bearing and the grace of their drapery put both Mexican and American to shame.

Nothing can be finer. Roman senators in togas never folded their arms better, or stood straighter. They make for the shops. They have walked all the way in from their village, twelve miles or more, having made a little money by selling some of their pottery. They have come in to spend the last dollar of it.

The two most interesting ruins in Santa Fé are the San



San Miguel.

Miguel Church and an old building opposite it, called the Indian House. This is, undoubtedly, the oldest house in America. It is a rough, two-story adobe, with a low, narrow door, and with windows like port-holes. The logs that hold up the dirt roof show no signs of decay, and the building is yet used as a tenement-house. The church is also of adobe, but built

on a foundation of small stones laid in mortar, which is the reason of its wonderful preservation. It was first built in 1640, was partially destroyed by the Indians in their revolt in 1680, and built up again in 1710. The interior of the church is still in tolerable repair, and service is held in it.

The altitude of Santa Fé is a little over seven thousand feet. Its winters are sunny and mild; a little snow falls occasionally, but it never lies long, and the air is exceptionally dry.

HELEN HUNT JACKSON.

New Mexico.

It was midnight when we were landed at the Santa Fé station, on the south side of the town. The moon was shining brightly. In a moment I was riding, in effect, through foreign streets. They were narrow, rocky, lined with squatty, unlighted, silent, sombre adobe houses. It seemed as if a gentle, fun-making earthquake had jostled them out of line, tilted them off base, started them down grade, perched them in awkwardness. Un-American! Old! I cannot conceive of a time when those old adobes were not there, sprouts from the adobe soil, as it were.

The next day after I arrived at Santa Fé I asked the price of a large plum of a Mexican dealer.

“Five cents; not less could be.”

“One for three cents?” I asked.

With scorn the dealer replied, “No three cent here! Five cents lessest money here. One plum, two, three, four plum — all same; five cent.”

Seller, buyer, Spanish, American people alike have here contempt for the change-making of the East, all declaring that they would not live with people so mean as to bother with change for five cents.

One reason why provision-dealers in these mountain towns can sell their wares nearly at Eastern prices is, because in the cool, pure, dry air of New Mexico, foods do not spoil. In Santa Fé the tradesman delivers you a slice of butter as he does a slice of cheese with no fear, even in July, of its melting, and it reaches the consumer in August as firm as in December.

Rents average somewhat higher in this little-understood territory than in the Mississippi Valley, but the fine climate confers on your apartments unexpected adaptability. The comfort possible in a couple of adobe-rooms, which are usually

large, is a surprise to a person brought up in the North. Bivouacking is possible every day, and makes indoor comforts less imperative. You can go picnicking forty-eight out of fifty-two weeks.

Nowhere are sun and air on better behavior. There is scarcely a summer morning when a light piñon fire would be oppressive; scarcely a winter noon when you might not dispense with all fire.

I had ever at hand, ready-made, the means for keeping a comfortable bodily temperature. If the air was too cool, I moved into the sunshine; if unduly warm, into the shade, and the relief was always immediate and complete.

I had heard that the people were foreign, unapproachable and unsympathizing! Instead of this, in the most cordial friendliness they began at once to advise me what to do, and what not to do, to get the full value of my visit.

Mexican ladies are chary about seeking the acquaintance or friendship of visiting States people, but they are responsive to your advances or calls.

If you ask a Mexican gentleman to direct you to some place, he will not only give you the information, but will give time, if it seems to him necessary, in showing you to the place and explaining noticeable features. At parting he will thank you for the pleasant hour you have given him.

A Mexican lady acquaintance cheerfully spent a morning showing me from one place to another, looking for rooms, pointing out advantages and disadvantages, advising me as to prices and neighborhoods.

When it was known that I intended to furnish rooms, there came the most surprising offers of loans—blankets, pillows, chairs, desk, table.

Beside loans I was offered gifts, as a cook-stove from an Alabamian who declared that she couldn't eat stove-cooked food, and that her cook would use nothing but the fireplace, as they did down South.

A Spanish friend sent word, "I will lend you my Mexican

to make you a fireplace. There's one in that angle of the wall. He'll open it."

They close fireplaces in a free and easy way down there. They break up a little space of the yard, stir in water, and fill the fireplace to the jambs with the plastic clay. The mud is then smoothed with the hand, trowel-like, finishing with mud whose brown has been lightened with coloring matter.

The Mexican that was loaned to me cut into the adobe packing with which some former tenant has filled the fireplace, carried it into the yard, brought it back plastic, smeared it over jambs, hearth and mantelpiece, finishing all smoothly by



A Mexican Street.

the pliable hand. It was all by primitive methods, but the comfort and health that resulted from that bright little adobe fireplace will make the name of one Spanish señora a sound of music to my heart.

You have heard, no doubt, that the people of New Mexico are lazy, to use plain English; that the territory is the land of *Mañana* — the land of to-morrow.

Before I deny or confirm that statement, let me ask, Who

are the people of New Mexico? By the census of 1890 it had more than one hundred and fifty thousand inhabitants, without counting the Indians on the reservations. The area being so vast and the population so scattered, there is some difference in the estimate.

About one-fourth of the entire population are Americans, and a large part of these were born in New Mexico. The Americans of New Mexico are the equals in culture and in enterprise of the Americans in any part of the United States.

Of the people not American, about one-eighth are of Spanish descent and three-eighths of Indian descent. The other half are of a mixed race, Spanish and Indians, by the Americans commonly called greasers.

To say, "The rich people are Spanish, the poor are Mexicans," is a taunt in New Mexico. There is a proud protest in many minds against being consigned to that bottomless genealogical pit entitled Mexican. On the other hand, I have met many people of pure Spanish blood who resent being called Spaniards, claiming with pride that they are Mexicans.

If people mean that the peasant or laboring Mexican is lazy, my observation leads me to contradict the statement. In a climate so invigorating as that of New Mexico, laziness is hardly possible. Mexicans are indifferent to many things about which the people of the United States are anxious, and for which they struggle.

Some conditions of comfort regarded as essential, the Mexican has without the cost of labor or money. A large percentage of the world's work is done to keep the bodily temperature within its narrow normal range. In New Mexico this work is not needed, for there is but little extreme cold or extreme heat to guard against.

"Make hay while the sun shines," has small significance in a land where there are three hundred and sixty-five days of sunshine in the year, and where there are four or five crops of hay to the season, and not a stack or a mow is ever mildewed.

The fact is that the Mexican peasants are workers from childhood. They are reserved toward Americans. They do not importune for work, but I never asked one for service of any kind that I did not get the service at reasonable price. There is no task that a Mexican will not undertake, especially if he can reënforce himself by the assistance of a burro.

The burro, facetiously called "the sweet singer of Mexico," has a range of only two notes, but these are powerful. This is what heartless people say of the burro. "The perfect playmate for boys" would be a more just title.

All the children of New Mexico learn to ride burros, which



Burros and their Burdens.

are as docile and harmless as hobby-horses. One often sees four or five boys on one of these patient creatures, or two or more men, their legs dangling almost to the ground. It is not a matter for surprise that brute playmates have been expressed to New York and other Eastern cities for children's use in learning, without danger, saddle-riding and driving.

The loads that the burros will carry are remarkable. They take the place of market-wagons. I recall a caravan of a score of these pack-animals under one driver. They would come to town laden with melons, or mission grapes, or other wares, bringing loads larger and heavier than themselves.

Like soldiers under drill, they would range themselves in ranks before a store on the sidewalk. Nobody was offended or afraid, for they were cleanly and harmless.

As soon as one was unpacked he would walk off into the street, where he was sure to find something to eat, if only a bit of paper. The goat is no more nearly omnivorous than the Mexican burro.

In a ride of fifteen miles out of Santa Fé I once met two hundred and fifty-three burros, with packs, industriously plying their mouse-colored legs. The loads were largely cedar and piñon wood, cut and split.

I have seen a burro carrying a cook-stove, or bringing over mountain-roads timbers for a house. When they are carrying unbaled hay they present a most amusing appearance. One sees the great ears working, a tail switching, and four little hoofs twinkling; all the rest is a moving haystack.

If there was ever a flesh and blood creature capable of living on a straw a day, it is the hardy, faithful Mexican burro. So inexpensive is its keeping, with its unstable habits of life, that the poorest peasant can afford the comfort of this helpful companion, the friend of the mountaineer. It will obey every tone of the master, every touch of his hand. But a stranger must study burros well to get their best service.

SARAH WINTER KELLOGG.



Adobe.

I have frequently watched the making of adobes by the natives of New Mexico. Adobes are sun-dried bricks about twelve inches long, eight wide and two deep. They are used where the States' people would employ kiln-seasoned bricks and stone, and for many purposes for which lumber is used in a wooded section. Fences, for instance, are largely made of adobes ; corrals, gardens, orchards, yards, churches, schools and convents are enclosed by walls built of adobes.

These mud walls are often seen with cacti planted thickly on their tops, as a double security against thieving or other purposes. When cacti are not easily procurable, the walls are defended by broken glass bottles, imbedded in the top round of bricks before they are thoroughly dry.

On lines where protection is not called for, I have seen the tops of these fences picturesquely ornamented with bright flowering plants, such as scarlet and yellow cacti, the wild sunflower, the Spanish bayonet and the Mexican lily.

When a house is to be built, an addition to be made to one, an oven to be built or a fireplace, or a piece of ground to be enclosed, the enterprising Mexican assembles his helpers as at a primitive house-raising. The first move is to spade up a patch of ground, often a portion of his own front yard. Sometimes, as an act of friendliness, the adobe-maker gets permission to spade up a neighbor's yard, or a vacant lot near the building site.

The ground being well broken, water is brought on and the mixing is begun. As the surface, before the breaking, was in all probability but carelessly swept, many bits not essential to good bricks get mixed in the mud — bits of glass, stone, pottery, tin, wire, chips, rags, etc. But it is not in the purpose of the adobe-makers to use other materials than water and the soil everywhere found.

There is a little preliminary mixing with hoe and spade, but shortly the workers strip to the waist, bare the feet, roll above the knees whatever there may be of trousers legs, and walk bravely into the mud. Standing in the brown mixture of precisely his own color, the expressionless, statuesque Mexican might, by an easy reach of fancy, be regarded as an



Making Adobe.

outgrowth of the adobe mud. Now hands and feet reenforce spade and hoe, until the mixing is complete.

Rough wooden molds are then filled by the hands with the mud, and scraped level by the hands. The molds are carried away a short distance and the molded mud is tipped out on the ground.

There the adobes lie for days or weeks, sunning, while the owners are sunning themselves against adobe walls centuries old, it may be. There is no fear of the blocks being spoiled

by rain, in this white and bright land where the sun shines three hundred and sixty-five days in the year.

The mud-bricks being sufficiently baked on one side, they are turned over, and in time, on edge, until all sides and edges have had the effect of a sufficient period of direct sunshine.

An Eastern brickmaker would regard these adobe bricks as rough, uneven, unsightly. But they have their merits. Their making does not call for any skilled labor; they can be made in a day, dried without expense, and can be laid by inexperienced hands. They form such inexpensive building material that the poorest man can have his own house.

I have seen many a comfortable adobe house of four rooms, plastered well inside and out, erected at a cost of five hundred dollars.

I choose the adjective comfortable advisedly. Without the shelter of a tree, in a land of perennial sunshine, an adobe house furnishes a complete protection from summer heat, however high the mercury may be. The earth walls never get heated through in such a climate as New Mexico's; neither do they ever get chilled through.

In the shelter of an adobe house, you can forget that there is winter cold or summer heat.

The Mexican peasant builds an unpretentious lodge, but for comfort it will stand comparison with the peasant-house of any land. He lays the adobes on the bare earth, builds up two or three feet, then waits some days to insure the walls' dryness, builds a few more feet and again waits.

When his wall has reached a height of ten or twelve feet he stops. Then he lays on the beams or rafters, usually of the unbarked trunks of the piñon-trees, not fully grown. The piñon is the mountain pine of the nut-bearing variety.

The rafters are not of uniform length. Some project a foot over the wall, others more than a yard, furnishing a place for drying plants, or for the storing of hay, or for the roosting of Mexican boys ambitious enough to climb to the roof.

These rafters are the support for the thick planks or boards

laid closely across, which are to receive the dry adobe dirt. This is piled on, to the thickness of about thirty inches. This makes a dry, warm roof, on which, in the course of time, chance seeds take root, causing a little forest of plants to spring up on the low roofs.

The dirt roofs are safe as long as the timbers are sound, and the timbers, being measurably protected from damp and air, remain good for long periods.

But ants sometimes find out the rafters of a house and honeycomb them, making no visible sign of their presence. The timber then suddenly gives way, letting down the mass of earth, imperilling life and injuring the house's belongings. The brother of a Santa Fé banker once lost his life by the falling in of one of these dirt roofs. Many adobe houses, however, both old and new, have roofs of a better character.

One might think that the adobe house would be a perishable structure. In a land of rains, of much freezing and thawing, it might be; but there are adobe houses in New Mexico and Arizona centuries old, and as good as when first built.

Some adobe houses have walls eight feet thick. These were built not only for sure protection against heat and cold, but also as defences against Indians and other enemies.

The adobe house is the outcome of ages of experience in a climate of peculiar conditions. The Americans have introduced some architectural improvements, but they have taught the Mexicans little of real value in their climate.

Even the wealthy Mexican of to-day, educated, it may be, in Washington or St. Louis, builds preferably an adobe house. If one is built on a stone foundation, with hooded windows, far-projecting roof, with balconies or portals, there is no more comfortable, weather-proof, picturesque dwelling. For a small expenditure, a house can be built in that delightful climate in which not an hour of discomfort from heat or cold need be spent in all the year.

SARAH WINTER KELLOGG.

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